Racial segregation and disparities in breast cancer care and mortality

Published in final edited form as:
Cancer. 2008 October 15; 113(8): 2166–2172. doi:10.1002/cncr.23828.

Racial Segregation and Disparities in Breast Cancer Care and Mortality

Jennifer S. Haas, MD, MSPH[1,2], **Craig C. Earle, MD**[3], **John E. Orav, PhD**[1,2], **Phyllis Brawarsky, MPH**[1], **Marie Keohane**[1], **Bridget A. Neville, MPH**[3], and **David R. Williams, PhD, MPH**[4]

[1] Division of General Medicine and Primary Care, Department of Medicine, Brigham and Women's Hospital, Boston, MA, USA

[2] Harvard Medical School, Boston, MA, USA

[3] Department of Medical Oncology, Dana-Farber Cancer Institute, Boston, MA, USA

[4] Department of Society, Human Development, and Health, Harvard School of Public Health, Boston, MA, USA

Abstract

Objectives—To examine whether residential segregation is a mediator of racial/ ethnic disparities in breast cancer care and breast cancer mortality, or has a differential effect by race/ ethnicity.

Methods—Data from the Surveillance, Epidemiology and End Results-Medicare database on white, black, and Hispanic women age 66 to 85 years with breast cancer were examined to look at the receipt of adequate breast cancer care.

Results—Blacks were less likely than whites to receive adequate breast cancer care (odds ratio {OR} 0.78; 95% confidence interval {CI} 0.71 - 0.86). Individuals, both black and white, who lived in areas with greater black segregation were less likely to receive adequate breast cancer care (0.73; 0.64 – 0.82). Black segregation was a mediator of the black/ white disparity in breast cancer care, explaining 8.9% of the difference. After adjustment, adequate care for Hispanics did not significantly differ from whites, but individuals, both Hispanic and white, who lived in areas with greater Hispanic segregation were less likely to receive adequate breast cancer care (0.73; 0.61 – 0.89). While Blacks experienced greater breast cancer mortality than whites, black segregation did not substantially mediate the black-white disparity in survival, and was not significantly associated with mortality (hazard ratio 1.03; CI 0.87– 1.21). Breast cancer mortality did not differ between Hispanics and whites.

Address for Correspondence and Reprints: Dr. Jennifer Haas, Division of General Medicine and Primary Care, Brigham and Women's Hospital, 1620 Tremont Street, Boston, MA 02120-1613. Telephone: 617-525-6652. Fax: 617-732-7072. E-mail: jhaas@partners.org.

Contributors: J. Haas originated and supervised the study in its entirety. C. Earle was substantively involved in the design, analysis, and interpretation of this project. J. Orav directed the statistical analysis and the interpretation. P. Brawarsky and B. Neville participated in the analysis and interpretation of the data. M. Keohane helped with background research related to the manuscript. D Williams provided expertise on the measurement of segregation, and the interpretation of the findings. All of the authors participating in writing, editing and revising the manuscript.

Support: This work was supported by the National Cancer Institute (R01 CA112451).

Condensed Abstract: Among seniors, segregation mediates some of the black-white disparity in breast cancer care. Individuals who live in more segregated areas are less likely to receive adequate breast cancer care.

Conclusions—Among seniors, segregation mediates some of the black-white disparity in breast cancer care, but not mortality. Individuals who live in more segregated areas are less likely to receive adequate breast cancer care.

Keywords

race; ethnicity; breast cancer; segregation

Introduction

Several studies have documented that black and Hispanic women are less likely than white women to receive adequate treatment for breast cancer,[1-4] and experience greater mortality.[5, 6] Racial differences in treatment are not fully explained by differences in clinical and non-clinical factors such as stage, age, comorbidity, health insurance, region, and socioeconomic status.[1, 4, 7-11] Residential segregation, the physical separation of one racial/ethnic group from others, may adversely affect access to high quality medical care.[12, 13] Residential segregation is more pronounced for blacks than any other racial/ethnic group in the US.[12] Segregation may be an important cause of racial/ ethnic disparities in care and outcomes.[12, 14, 15] For instance, neighborhood racial and ethnic composition may account for some of the disparities in access to medical care.[13] We sought to further elucidate this relationship between residential segregation and the adequacy of care and mortality for women with breast cancer. To our knowledge, the role of segregation on disparities in cancer treatment has not been explored. The purpose of this study is to examine whether racial segregation mediates disparities in breast cancer treatment and mortality among US seniors, or has a differential effect for different racial/ ethnic groups.

Methods

Data

This analysis uses data from the Surveillance, Epidemiology and End Results (SEER)-Medicare file.[16] The population covered by SEER is comparable to the US population with regards to poverty and education, but tends to be somewhat more urban and has a higher proportion of foreign-born persons than the general US population. These data include information about cancer stage, primary tumor site, and patient demographics and are linked to Medicare claims data by the National Cancer Institute. Data were available for individuals diagnosed with cancer from 1992 to 2002. A restricted access version of these data was obtained so that the characteristics of each individual's census tract of residence, from the 1990 US Census, could be appended. This study was reviewed and approved by the Institutional Review Board of Brigham and Women's Hospital.

Study Sample

Women age 66 to 85 years, whose race/ethnicity was reported as white, black or Hispanic and who were diagnosed with American Joint Committee on Cancer (AJCC) Stage I, II, or IIIA breast cancer as a single primary from 1992 to December 2002 were included in this analysis (n = 70,541). As is typical with analyses based on SEER-Medicare data, we excluded women younger than 66, so that we would have at least one year of Medicare claims to assess comorbidity.[17] We also removed women who had HMO coverage and those who were not covered by both Parts A and B for at least 1 year before and 1 year after diagnosis with breast cancer, to ensure that Medicare billing claims were complete (n= 22,508). We excluded women over the age of 85 because of more clinical uncertainty about the management of these women. Because our analysis was focused on the role of

residential segregation, we excluded an additional 167 individuals with a missing census tract identifier. The final sample included 47,866 women.

Variables

Our outcome measure was whether women with breast cancer received adequate breast cancer care. We focused on a previously developed measure of the adequacy of breast cancer care using SEER-Medicare data.1 Adequate care was defined as receipt of effective surgery (either mastectomy or breast conserving surgery {BCS} with radiation therapy) within 6 months of diagnosis, and an assessment of estrogen receptor (ER) status at the time of surgery. BCS with radiation therapy and mastectomy have equivalent survival.18 BCS without radiation is considered to be inadequate therapy, as this treatment is associated with a higher risk of recurrence. Women who received both BCS and mastectomy (both within 6 months of diagnosis) were classified as having a mastectomy (n = 10,679). Assessment of ER status is necessary to determine appropriate chemotherapy. We did not examine the use of chemotherapy, as this was not included in the established indicator of prior breast cancer care.1

To measure residential segregation, we used the isolation index, a measure of the probability that a member of one racial/ethnic group is likely to be in contact with members of this same group (as opposed to whites), compared with residential neighbors in the same census tract calculated using the population within 1990 census tracts and counties.19, 20 It is calculated separately for blacks and Hispanics. For instance, the isolation index for blacks within a county = $\sum (b_i/ b_{total}) \times (b_i / T_i)$; where i = one of N census tracts in the county, b_i = the number of blacks in the census tract i, b_{total} = the total number of blacks in the county, and T_i = the total population of census tract *i*.21 We divided large counties with populations greater than approximately 500,000, such as Los Angeles, into smaller, municipal areas based on locally defined neighborhoods, and calculated the isolation indices for these municipalities based on the census tract populations within these regions.22 We took this approach because of a growing social science literature that suggests that these areas play a meaningful role in the structure of social processes associated with place of residence, including segregation.22, 23 Municipal areas were defined using information from local urban planning departments and census maps. There are 463 counties in the dataset; 36 of these were separated into 697 municipal areas.

The isolation index ranges from 0 to 1.0, with a higher number indicating greater segregation.24 For example, a county with a black isolation index of 0.6 suggests that a black individual in that county would be very isolated, having a 60% chance of having only other blacks as neighbors. The median household income of the census tract was also included as an independent variable (categorized as < $20,000, $20-39,999, $40-$59,999, ≥ $60,000).

Individual-level independent variables included age at diagnosis (continuous), race/ ethnicity (white, black, Hispanic), marital status (married, not married), cancer stage (I, II, IIIA, based on the modified AJCC), tumor size (continuous in centimeters), Charlson comorbidity index (categorized as 0, 1, 2, ≥ 3),25 whether an individual was of “low income” (based on eligibility for state assistance with Medicare premiums and co-payments), region of residence (Northeast, Midwest, South, West) and year of diagnosis. Missing tumor size (N= 2,262) was imputed by the average tumor size for each race/stage.

Analysis

Characteristics of black and Hispanic women were compared to characteristics of white women using chi-square tests. To examine the effect of race/ ethnicity and segregation on

receipt of adequate care we used multi-level logistic regression models, clustered by county, using SAS version 9 (SAS Institute, Cary, NC). Initial models were adjusted for age at diagnosis, race/ ethnicity, marital status, comorbidity, eligibility for state buy-in coverage, cancer stage, tumor size, year of diagnosis, census region, and the median household income of the census tract of residence. If a significant racial/ ethnic effect was found, then the segregation index was entered into the model and if the index decreased the racial/ ethnic effect then segregation was considered to be a mediator. We examined separate models for blacks compared with whites, and Hispanics compared with whites. To examine the effect of race/ ethnicity and segregation on breast cancer mortality we used Cox proportional hazard models, clustered by county, using SUDAAN version 9, using the same variables described above. Survival was defined as the interval from the date of diagnosis to the Medicare date of death from breast cancer, and if that was missing, SEER date of death. Patients alive at the end of the study period (December 31, 2003) or who died from other causes were censored at that point and contributed the time interval from their date of diagnosis to the end of the study in the survival analysis.

Results

We compared the demographic characteristics of individuals included in our sample to those who were excluded because of HMO coverage or limited claims data. Individuals included in the sample were slightly more likely than those excluded to be disadvantaged (rate of ever having qualified for state buy-in coverage of 15.6% vs. 15.0%). Individuals included were somewhat less likely to be black than those who were excluded (6.0% vs. 7.0%), but were much less likely to be Hispanic (3.6% vs. 8.7%).

Compared to white women, black and Hispanic women were younger, less likely to be married, and more likely to have ever been eligible for state buy-in coverage (Table 1). Black and Hispanic women had more comorbidity than whites. Black and Hispanic women were both more likely to be diagnosed at a later stage and with a larger tumor than white women. Overall, only 62.6% of women received adequate breast cancer care (mastectomy or BCS with radiation, and assessment of ER status), and black and Hispanic women were less likely than white women to have received this measure of adequate breast cancer care. Specifically, minority women were less likely to have received BCS with radiation, or assessment of ER status. There was no difference in the use of mastectomy between the three racial/ ethnic groups. Blacks were less likely than whites to survive 5 years following their diagnosis, whereas there were no differences in survival between whites and Hispanics. Whites lived in areas with a highest median household income, and blacks the lowest. Blacks lived in areas with greater black isolation than whites or Hispanics, and Hispanics lived in areas of greater Hispanic isolation than whites or blacks. Blacks were more likely than whites and Hispanics to live in the south or the mid-west. Hispanics were more likely than whites and blacks to live in the west. Black isolation was greatest in the south (mean isolation index 0.36) and lowest in the west (mean isolation index 0.11). Hispanic isolation was greatest in the west (mean isolation index 0.23) and lowest in the mid-west (mean isolation index 0.02).

After adjustment for individual characteristics and median household income of the census tract, but not segregation, blacks were less likely than whites to receive adequate care (odds ratio {OR} 0.72; 95% confidence interval {CI} 0.65 - 0.78). Black segregation mediated some of the disparity in receiving adequate care. As black segregation increased, women, both black and white, were less likely to receive adequate breast cancer care (Table 2: OR 0.73; CI 0.64 – 0.82). Segregation reduced the black-white disparity in adequate care by 8.9% (unadjusted OR = 0.72 for segregation versus 0.78 adjusted). In a model that adjusted only for demographic and clinical characteristics (age, marital status, comorbidity, tumor

size, cancer stage, prior Medicaid coverage, and year of diagnosis), 9.9% of the black-white disparity in the adequacy of breast cancer care was explained by these variables. The model that adjusted for segregation and median household income of the census tract in addition to the demographic and clinical characteristics explained 25.3% of the black-white disparity in receiving adequate breast cancer care.

Although Hispanics were less likely than whites to receive adequate care after adjustment for demographic characteristics, comorbidity, cancer stage and tumor size (OR 0.82, 95% CI 0.74 – 0.91) this disparity did not persist in the multi-level models that accounted for residential segregation (OR 0.99; CI 0.88-1.10) (Table 2). In a model that adjusted only for demographic and clinical characteristics (age, marital status, comorbidity, tumor size, cancer stage, prior Medicaid coverage, and year of diagnosis), 1.9% of the Hispanic-white disparity in the adequacy of breast cancer care was explained by these variables. The model that adjusted for segregation and median household income of the census tract in addition to the demographic and clinical characteristics explained 9.1% of the Hispanic-white disparity in receiving adequate breast cancer care. Greater Hispanic segregation was associated with a lower likelihood of receiving adequate care, for both Hispanic and white women (OR 0.74; CI 0.61– 0.89). Older women, women with more comorbidity, early stage, and those who were ever eligible for state buy-in insurance were also less likely to receive adequate care.

Blacks experienced greater breast cancer mortality than whites, even after adjusting for whether they received adequate care (adjusted Hazard Ratio (HR) 1.44; CI 1.27-1.63). Adequate care was associated with lower mortality (HR 0.82; CI 0.76 – 0.87). Black segregation did not substantially mediate the black-white disparity in survival, and was not significantly associated with mortality (HR 1.03; CI 0.87– 1.21). Breast cancer mortality did not differ between Hispanics and whites (HR 0.94; CI 0.78 – 1.13).

Discussion

This work confirms that many women do not receive adequate care for breast cancer and that there are black-white disparities in breast cancer care and mortality. [1-5, 11] Women who live in more segregated areas were less likely to received adequate breast cancer care. This work also suggests that residential segregation may mediate some of the black-white disparity in breast cancer care, but not mortality. We did not find Hispanic-white disparities in breast cancer care or mortality in the fully adjusted models, although disparities in care were apparent in models that only controlled for individual-level characteristics.

Several studies suggest that breast cancer treatments are underutilized by black women relative to white women, after accounting for differences in cancer stage.[2, 26, 27 3, 28, 29] Racial differences in the use of breast cancer treatment may be related to differences in access to specialized providers,[30, 31] racial bias in referral patterns or treatment recommendations,[32, 33] preferences for treatment,[34, 35] communication or understanding about risks and benefits,[36] and trust in the health care system or research.[37, 38] Segregation has been demonstrated to have adverse economic, political, and social consequences.[39] We hypothesized that segregation may limit access to specialized cancer providers or to information or understanding of treatment options. Segregation may influence preferences for care, or beliefs about the efficacy and side effects of cancer treatment.[34] This work suggests that segregation for blacks may adversely affect access to breast cancer care. To the best of our knowledge, prior work has not examined the role of segregation on the use of cancer treatment.

Segregation may be associated with a decline in the adequacy of breast cancer care for whites and blacks because of more limited access to specialized providers in more

segregated areas. Our work is consistent with the observation that women living in high-poverty ZIP codes are less likely to receive radiation following BCS than are women living in ZIP codes with lower levels of poverty.4 Our work is also consistent with a recent study of patients with end stage renal disease that showed that time to transplantation was longer among both black and white patients in more segregated areas and that dialysis facilities located in these areas may be of lower quality.40 Prior work suggests that black and white patients are treated by different physicians, and that physicians who care for black patients may have fewer clinical resources and are less likely to be board certified.41 As blacks are much more likely to live in segregated areas than whites, our findings may be explained by the location of these physicians in more segregated areas. In contrast to the decline in the use of adequate breast cancer care with increasing segregation, segregation was not a mediator of disparities in breast cancer mortality among these seniors between blacks and whites. It is not surprising that the effects of segregation were more limited for Hispanics than for blacks, as blacks are more segregated than other racial/ ethnic groups in the US.42

Our work has several limitations. Although we were able to adjust for the socioeconomic status of the area where an individual lived, we had limited information about individual socioeconomic status (i.e., eligibility for state buy-in coverage for Medicare). There is a growing portfolio of effective, increasingly personalized breast cancer treatments beyond the ones measured here. We focused on a previously developed measure of breast cancer care that would be applicable to the vast majority of women with breast cancer. SEER-Medicare data has been found to be reasonably accurate for assessing the use of surgery, radiation therapy, ascertainment of ER status, and surveillance mammography.43-46 As we examined the care of seniors, our findings may not be generalizable to younger women. Disparities in care may be larger for younger women, particularly since this senior population was all covered by Medicare.47 As has been done in other analyses using these data, we excluded individuals with HMO coverage and those with less than one year of claims before or after diagnosis so that comorbidity and treatment could be adequately assessed.17 Again, this may limit the generalizability of our findings although the racial/ ethnic and socioeconomic characteristics of those included vs. excluded were similar except for Hispanics. Our analyses are observational and should not be considered causal. Ascertainment of Hispanic ethnicity is likely not complete in SEER or Medicare files, meaning that some Hispanics were probably misclassified.

Among seniors, segregation may mediate some of the black-white disparity in breast cancer care but not mortality. We did not find disparities in breast cancer care between Hispanics and whites. Segregation was adversely associated with the adequacy of care for all women. Future research should examine mechanisms for these associations, like differences in the availability of specialized providers or the dissemination of health information, so that appropriate interventions can be designed.

Acknowledgments

We thank Joan Warren, PhD for her helpful comments on an earlier version of this manuscript. We thank Philip J. Ethington, PhD for sharing methods for creating measures of residential segregation in municipal areas.

References Cited

1. Haggstrom DA, Quale C, Smith-Bindman R. Differences in the quality of breast cancer care among vulnerable populations. Cancer. 2005; 104(11):2347–58. [PubMed: 16211547]
2. Morris CR, Cohen R, Schlag R, Wright WE. Increasing trends in the use of breast-conserving surgery in California. Am J Public Health. 2000; 90(2):281–4. [PubMed: 10667193]

3. Ballard-Barbash R, Potosky AL, Harlan LC, Nayfield SG, Kessler LG. Factors associated with surgical and radiation therapy for early stage breast cancer in older women. J Natl Cancer Inst. 1996; 88(11):716–26. [PubMed: 8637025]
4. Mandelblatt JS, Kerner JF, Hadley J, et al. Variations in breast carcinoma treatment in older Medicare beneficiaries: is it black or white. Cancer. 2002; 95(7):1401–14. [PubMed: 12237908]
5. Weir HK, Thun MJ, Hankey BF, et al. Annual report to the nation on the status of cancer, 1975-2000, featuring the uses of surveillance data for cancer prevention and control. J Natl Cancer Inst. 2003; 95(17):1276–99. [PubMed: 12953083]
6. Smigal C, Jemal A, Ward E, et al. Trends in breast cancer by race and ethnicity: update 2006. CA Cancer J Clin. 2006; 56(3):168–83. [PubMed: 16737949]
7. Shavers VL, Brown ML. Racial and ethnic disparities in the receipt of cancer treatment. J Natl Cancer Inst. 2002; 94(5):334–57. [PubMed: 11880473]
8. Bickell NA, Wang JJ, Oluwole S, et al. Missed opportunities: racial disparities in adjuvant breast cancer treatment. J Clin Oncol. 2006; 24(9):1357–62. [PubMed: 16549830]
9. Li CI, Malone KE, Daling JR. Differences in breast cancer stage, treatment, and survival by race and ethnicity. Arch Intern Med. 2003; 163(1):49–56. [PubMed: 12523916]
10. Joslyn SA. Racial differences in treatment and survival from early-stage breast carcinoma. Cancer. 2002; 95(8):1759–66. [PubMed: 12365025]
11. Field TS, Buist DS, Doubeni C, et al. Disparities and survival among breast cancer patients. J Natl Cancer Inst Monogr. 2005; (35):88–95. [PubMed: 16287892]
12. Williams DR, Collins C. Racial residential segregation: a fundamental cause of racial disparities in health. Public Health Rep. 2001; 116(5):404–16. [PubMed: 12042604]
13. Kirby JB, Taliaferro G, Zuvekas SH. Explaining racial and ethnic disparities in health care. Med Care. 2006; 44(5 Suppl):I64–72. [PubMed: 16625066]
14. LaVeist TA. Racial segregation and longevity among African Americans: an individual-level analysis. HSR. 2003; 38(6-II):1719–33. [PubMed: 14727794]
15. Polednak AP. Trends in US urban black infant mortality, by degree of residential segregation. Am J Public Health. 1996; 86(5):723–6. [PubMed: 8629726]
16. Warren JL, Klabunde CN, Schrag D, Bach PB, Riley GF. Overview of the SEER-Medicare data: content, research applications, and generalizability to the United States elderly population. Med Care. 2002; 40(8 Suppl):IV-3–18.
17. Klabunde CN, Warren JL, Legler JM. Assessing comorbidity using claims data: an overview. Med Care. 2002; 40(8 Suppl):IV-26–35.
18. Treatment of early stage breast cancer NIH consensus statement, 1990 (Accessed at http://odp.od.nih.gov/consensus/cons/081/081_statement.htm)
19. Subramanian SV, Acevedo-Garcia D, Osypuk TL. Racial residential segregation and geographic heterogeneity in black/white disparity in poor self-rated health in the US: a multilevel statistical analysis. Soc Sci Med. 2005; 60(8):1667–79. [PubMed: 15686800]
20. Chang VW. Racial residential segregation and weight status among US adults. Soc Sci Med. 2006; 63(5):1289–303. [PubMed: 16707199]
21. Racial Residential Segregation Measurement Project Population Studies Center, University of Michigan, 2000 (Accessed November 11, 2007, at http://enceladus.isr.umich.edu/race/racestart.asp)
22. Ethington PJ, Park J, Frey W, Myers D. Placing Segregation: Isolation, Diversity and the Metropolitan Dynamics of Municipal Places in Los Angeles County, 1940-2000. American Journal of Sociology Submitted for publication.
23. Logan JR, Stults BJ, Farley R. Segregation of minorities in the metropolis: two decades of change. Demography. 2004; 41(1):1–22. [PubMed: 15074122]
24. MasseyDSDentonNAThe dimensions of residential segregation. Social Forces1988672281 (35 pages).
25. Klabunde CN, Potosky AL, Legler JM, Warren JL. Development of a comorbidity index using physician claims data. J Clin Epidemiol. 2000; 53(12):1258–67. [PubMed: 11146273]

26. Michalski TA, Nattinger AB. The influence of black race and socioeconomic status on the use of breast-conserving surgery for Medicare beneficiaries. Cancer. 1997; 79(2):314–9. [PubMed: 9010104]
27. Nattinger AB, Gottlieb MS, Veum J, Yahnke D, Goodwin JS. Geographic variation in the use of breast-conserving treatment for breast cancer. N Engl J Med. 1992; 326(17):1102–7. [PubMed: 1552911]
28. Farrow DC, Hunt WC, Samet JM. Geographic variation in the treatment of localized breast cancer. N Engl J Med. 1992; 326(17):1097–101. [PubMed: 1552910]
29. Riley GF, Potosky AL, Klabunde CN, Warren JL, Ballard-Barbash R. Stage at diagnosis and treatment patterns among older women with breast cancer: an HMO and fee-for-service comparison. JAMA. 1999; 281(8):720–6. [PubMed: 10052442]
30. Earle CC, Neumann PJ, Gelber RD, Weinstein MC, Weeks JC. Impact of referral patterns on the use of chemotherapy for lung cancer. J Clin Oncol. 2002; 20(7):1786–92. [PubMed: 11919235]
31. Earle CC, Venditti LN, Neumann PJ, et al. Who gets chemotherapy for metastatic lung cancer? Chest. 2000; 117(5):1239–46. [PubMed: 10807806]
32. Oddone EZ, Horner RD, Monger ME, Matchar DB. Racial variations in the rates of carotid angiography and endarterectomy in patients with stroke and transient ischemic attack. Arch Intern Med. 1993; 153(24):2781–6. [PubMed: 8257254]
33. Schulman KA, Berlin JA, Harless W, et al. The effect of race and sex on physicians' recommendations for cardiac catheterization. N Engl J Med. 1999; 340(8):618–26. [PubMed: 10029647]
34. Margolis ML, Christie JD, Silvestri GA, Kaiser L, Santiago S, Hansen-Flaschen J. Racial differences pertaining to a belief about lung cancer surgery: results of a multicenter survey. Ann Intern Med. 2003; 139(7):558–63. [PubMed: 14530226]
35. Mandelblatt JS, Hadley J, Kerner JF, et al. Patterns of breast carcinoma treatment in older women: patient preference and clinical and physical influences. Cancer. 2000; 89(3):561–73. [PubMed: 10931455]
36. Keating NL, Weeks JC, Borbas C, Guadagnoli E. Treatment of early stage breast cancer: do surgeons and patients agree regarding whether treatment alternatives were discussed? Breast Cancer Res Treat. 2003; 79(2):225–31. [PubMed: 12825857]
37. Doescher MP, Saver BG, Franks P, Fiscella K. Racial and ethnic disparities in perceptions of physician style and trust. Arch Fam Med. 2000; 9(10):1156–63. [PubMed: 11115223]
38. LaVeist TA, Nickerson KJ, Bowie JV. Attitudes about racism, medical mistrust, and satisfaction with care among African American and white cardiac patients. Med Care Res Rev. 2000; 57(Suppl 1):146–61. [PubMed: 11092161]
39. Massey, DS.; Denton, NA. American apartheid : segregation and the making of the underclass. Harvard University Press; Cambridge, Mass. ; London, Eng.: 1993.
40. Rodriguez RA, Sen S, Mehta K, Moody-Ayers S, Bacchetti P, O'Hare AM. Geography matters: relationships among urban residential segregation, dialysis facilities, and patient outcomes. Ann Intern Med. 2007; 146(7):493–501. [PubMed: 17404351]
41. Bach PB, Pham HH, Schrag D, Tate RC, Hargraves JL. Primary care physicians who treat blacks and whites. N Engl J Med. 2004; 351(6):575–84. [PubMed: 15295050]
42. Massey, DS. America Becoming: Racial Trends and Their Consequences. 2001. America Becoming: Racial Trends and Their Consequences. Chapter 13: Residential Segregation Neighborhood Conditions in U.S. Metropolitan Areas; p. 391-428.
43. Cooper GS, Virnig B, Klabunde CN, Schussler N, Freeman J, Warren JL. Use of SEER-Medicare data for measuring cancer surgery. Med Care. 2002; 40(8 Suppl):IV-43–8.
44. Du X, Freeman JL, Warren JL, Nattinger AB, Zhang D, Goodwin JS. Accuracy and completeness of Medicare claims data for surgical treatment of breast cancer. Med Care. 2000; 38(7):719–27. [PubMed: 10901355]
45. VirnigBAWarrenJLCooperGSKlabundeCNSchusslerNFreemanJStudying radiation therapy using SEER-Medicare-linked data. Med Care2002408 SupplIV49-54.

46. Nattinger, A Butler; Schapira, MM.; Warren, JL.; Earle, CC. Methodological issues in the use of administrative claims data to study surveillance after cancer treatment. Med Care. 2002; 40(8 Suppl):IV-69–74.

47. Adler NE, Boyce T, Chesney MA, et al. Socioeconomic status and health. The challenge of the gradient. Am Psychol. 1994; 49(1):15–24. [PubMed: 8122813]

Table 1

Characteristics of Sample by Race/Ethnicity

	Black	Hispanic	White
N	2,875	1,704	43,287
Individual Characteristics			
Age at diagnosis * #	24.1%	25.6%	20.9%
66-70	29.1%	33.8%	29.3%
71-75	27.0%	23.5%	27.5%
76-79	19.8%	17.1%	22.2%
80-85			
Marital status	26.2%	39.6%	45.9%
Married[1]*#			
Comorbidity*#	57.6%	63.9%	71.9%
0	24.9%	23.1%	19.3%
1	8.7%	6.9%	4.9%
2	8.8%	6.1%	4.0%
≥3			
Ever eligible for state buy-in coverage*#	43.6%	47.7%	12.5%
Stage at diagnosis*#	45.8%	52.6%	59.5%
I	49.3%	44.3%	37.8%
II	4.9%	3.2%	2.7%
IIIa			
Tumor size*#	52.1%	61.1%	67.1%
≤ 2 cm	33.1%	30.6%	24.7%
2 – 4.99 cm	8.2%	4.9%	3.5%
> 5 cm			
Received adequate breast cancer (surgery and assessment of estrogen receptor status)*#	52.0%	58.4%	63.4%
Mastectomy	44.9%	45.5%	44.5%
Breast conserving surgery with radiation*+	22.8%	28.1%	32.1%
Assessment of estrogen receptor status*#	75.2%	78.1%	82.3%
5-year mortality from breast cancer**	17.1%	9.5%	8.3%
Area Characteristics			
Median household income/ census tract of residence##	$30,594	$40,198	$47,932
Median black isolation index (inter-quartile range++	.60	.05	.06
Median Hispanic isolation index (inter-quartile range)***	(.40-.88)	(.02-.16)	(.01-.20)
	.05	.41	.04
	(.01-.26)	(.22-.58)	(.02-.18)
Census Region *#	13.5%	11.7%	18.8%
Northeast	26.1%	1.9%	11.2%
South	34.8%	2.5%	25.7%
Midwest	25.6%	83.9%	44.3%
West			

NOTES:

[1] Data were missing for marital status (black 130; Hispanic 52; white 1,455), tumor size (black 189; Hispanic 57; white 2,000), median household income (black 10; Hispanic 13; white 238)

* p-value for chi-Square test , difference between black and white, ≤;.0001

p-value for chi-Square test , difference between Hispanic and white, <.0001

+ p-value for chi-Square test , difference between Hispanic and white, <.001

** p-value for log rank test comparing black and white < 0.0001

p-value for Wilcoxon test, difference between black and white, Hispanic and white, <.0001

++ p-value for Wilcoxon test, difference between black and white, <.0001

*** p-value for Wilcoxon test, difference between Hispanic and white, <.0001

Table 2

Multivariate Analysis: Individual Characteristics Associated with Adequate Care

	Black/White	Hispanic/ White
	Adequate Care	
Race/Ethnicity:		
White Black Hispanic	Reference 0.78 (0.71-0.86)	Reference 0.99 (0.88-1.10)
Age at diagnosis	0.98 (0.98-0.99)	0.98 (0.98-0.99)
Stage at diagnosis		
Stage I Stage II Stage IIIa	Reference 1.12 (1.07-1.18) 1.44 (1.25-1.67)	Reference 1.12 (1.07-1.18) 1.55 (1.33-1.80)
Comorbidity: 0 1 2 ≥3	Reference 0.99 (0.95-1.05) 0.81 (0.75-0.89) 0.87 (0.78-0.95)	Reference 0.99 (0.95-1.04) 0.83 (0..76-.91) 0.85 (0.77-0.93)
Marital status		
Married Not married	Reference 0.99 (0.95-1.04)	Reference 0.99 (0.95-1.04)
Ever eligible for state buy-in:		
No	Reference	Reference
Yes	0.89 (0.84-0.95)	0.88 (0.83-0.93)
Segregation Index:		
Black	0.73 (0.64-0.82)	
Hispanic		0.73 (0.61-0.89)